AMERICAN BOTTLES OLD AND NEW

AMERICAN BOTTLES OLD & NEW

A Story of the Industry in the United States



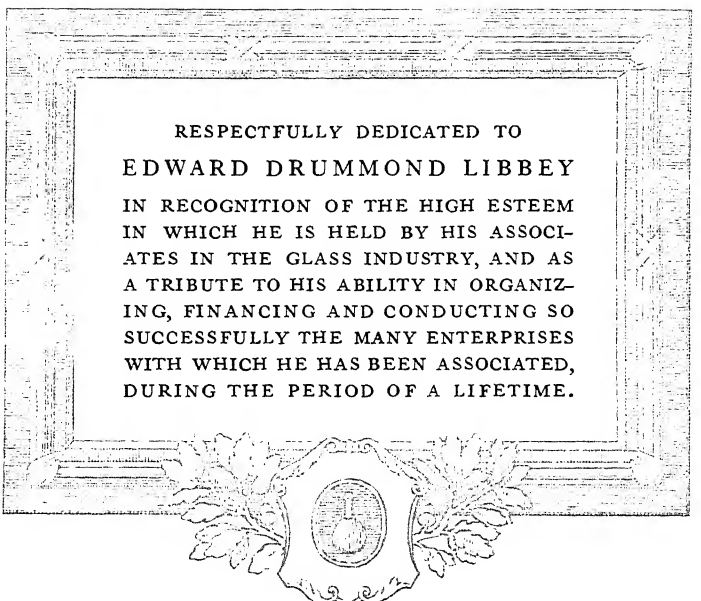
BY

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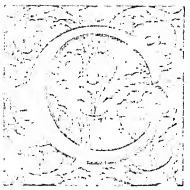
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THE OWENS BOTTLE COMPANY


RESPECTFULLY DEDICATED TO
EDWARD DRUMMOND LIBBEY
IN RECOGNITION OF THE HIGH ESTEEM IN WHICH HE IS HELD BY HIS ASSOCIATES IN THE GLASS INDUSTRY, AND AS A TRIBUTE TO HIS ABILITY IN ORGANIZING, FINANCING AND CONDUCTING SO SUCCESSFULLY THE MANY ENTERPRISES WITH WHICH HE HAS BEEN ASSOCIATED, DURING THE PERIOD OF A LIFETIME.

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PREFACE



OLLECTIONS of bottles are probably among the rarest of the many accumulations of antiques. Yet there is a fund of interest, second to none, in such a collection, showing as it does, in comparison with the modern shapes of bottles, the great changes that have taken place during the past century and a half in the art and process of manufacturing bottles.

It is largely by such direct comparison that we realize the developments, not only in the industry as a whole, but also in the bottles themselves, which have produced the improved types now in use.

Great difficulty has been encountered in tracing many of the antique bottles we now treasure. But few distinguishing marks are found, and the origin of many will always be enshrouded in doubt.

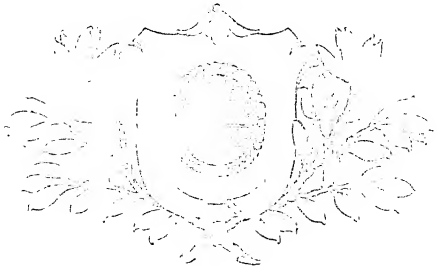
The author is indebted to many good friends in the Glass Industry for information, and for facts upon which this history is based.

Rev. Frank W. Gunsaulus, of Chicago, especially, contributed many specimens to the author's collection, and the interest of the late Edwin Atlee Barber, Curator of the Pennsylvania Museum and School of Art, was essential to the identification of many of the bottles. In this story accounts

are taken from Prof. Barber's history of "American Glass-ware — Old and New," published in Philadelphia in 1900. Descriptions of antiques are in instances drawn from "Colonial Homes and their Furnishings," by Mary H. Northend.

WM. S. WALBRIDGE

Toledo, Ohio, 1920.



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Chapter I

EARLY GLASS WORKS IN THE UNITED STATES

THE first industrial enterprise in the territory of the United States was established in the woods about a mile distant from Jamestown, Va., in 1607. It was a glass bottle factory. In the succeeding 250 years, thirty-three glass factories were put in operation in the United States.

Following the initial enterprise at Jamestown, research indicates the manufacture of coarse bottles and other articles of glass in 1639 at Salem, Mass. Though the date of its establishment is obscure, a glass factory was in operation in Philadelphia in 1683.

In New York City, two factories were operated in 1732, one in Connecticut in 1747, and another in Brooklyn in 1754. In 1760, glass bottles were made at Germantown, Mass., now the city of Quincy.

The first glass factory in New Jersey was built about 1738 at Allowaystown, Salem County. The sponsor of this enterprise was Casper Wistar, who imported from Rotterdam four skilled workmen for his plant. Bottles, as well as window glass, were made at this factory.

In 1775, glass manufacture was started at Glassboro, New Jersey, by the Stenger Brothers.

Robert Hewes, of Boston, in 1779 erected a glass factory at Temple, N. H., but the project was of short duration. A factory was started near Albany, N. Y., about 1792. The products were bottles and window glass. In 1797 this property passed into the hands of the Hamilton Manufacturing Company and was continued until 1815, when the works was closed. The Perkins Glass Works operated at Manchester, Conn., about 1783 to 1830.

In the early part of 1800, plants were established at Keene, N. H., Columbia, N. J., and at Coventry, Conn. During the same period, glass manufacture was also instituted at Stoddard, N. H., and Westford, Conn., by the Granite Glass Works and the Westford Glass Works. There were other plants at Baltimore, Md. The Spring Garden Works and the Willington Glass Works, Willington, Conn.

Early Glass Works in the United States

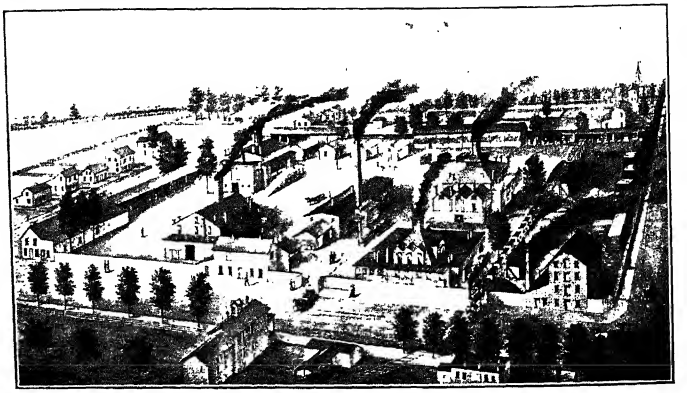
The Glass Industry moved West in 1795 to Pittsburgh, where operations were started by General O'Hara. Following the death of the General, a memorandum found among his papers gave the date of the first bottle manufactured in Pittsburgh and indicated its cost as $30,000.

In 1813 there were five glass factories in Pittsburgh. By 1857—250 years after the starting of the industry at Jamestown—Pittsburgh was considered the glass center of the United States, the more prominent of the thirty-three factories being located in that district.

The oldest glass establishment in the United States still doing business, is the Whitney Glass Works, of Glassboro, New Jersey.

This plant is now owned by The Owens Bottle Company, of Toledo, Ohio, and it is interesting to note that in this old glasshouse, and at the present adjacent to it in a plant known as Whitney Plant, Number Two, are installed the latest and most improved types of bottle blowing machines. Each of these machines is capable of producing upward of 40,000 bottles per day.

Especially interesting is the story of the Whitney Glass Works. Here one finds clearly illustrated the great strides made in the bottle industry in the past 145 years.



Whitney Glass Works, Glassboro, N. J.

(*Established in 1775*)

The oldest glass establishment in the United States still doing business. This plant is now owned by The Owens Bottle Company of Toledo, Ohio.

The following story of the development of the Whitney Works is taken from an historical sketch read by Thomas W. Synnott before the Historical Society of Glassboro, N. J., in 1905.

"In 1775, a number of glass blowers by the name of Stenger, who had been working at Wistar's Glass Works in Salem County, moved to Glassboro and purchased a piece of land, then covered with pine timber. After clearing the land, they built a small furnace and began the making of bottles that year.

"This plant was operated in the name of Stenger Brothers. They were fairly successful for a number of years.

"Some time in 1780–81, owing to the depreciation of the Continental Currency which was then worth about three cents on the dollar in gold, they failed, and being unable to pay the debts, were imprisoned in the Gloucester County Jail.

"The following year the property was sold and operated under the name of Heston and Carpenter, and was enlarged to take in flint and window glass. The original furnace was used solely to make dark green glass, in which wood ashes were largely used. This firm operated until 1802, and then was carried on under the name of Edward Carpenter & Company.

"In 1806, Captain Eben Whitney, of Castine, Me., on a voyage from Madeira, was wrecked on the New Jersey Coast, where he became acquainted with the daughter of Colonel Heston, and after their marriage settled in Glassboro, and became interested in the Glass Works.

"In 1813, a new Company was formed under the name of The Harmony Glass Works, this plant being on the site of the present Whitney Glass Works.

"In 1824, the original plant built in 1775, after fifty years' operation, was abandoned and consolidated with the new company.

"In 1835, Thomas H. Whitney purchased an interest in the Harmony Glass Works, and subsequently purchased entire control, and in 1842, with his brother, Samuel A. Whitney, formed the firm of Whitney Brothers, and changed the name of the company to the Whitney Glass Works.

"This firm continued until 1882, when it was dissolved by the death of Thomas H. Whitney and the retirement of Samuel A. Whitney, and a new firm, under the name of Whitney Bros., was formed by John P. Whitney and Thomas W. Synnott, great grandsons of Colonel Heston.

"This firm continued until 1887, when it was changed to Whitney Glass Works."

The following reference to the founding of the Whitney Glass Works was taken from "Steigel Glass," edited by Frederick William Hunter, A. M., in 1914:

"A notice inserted in the *Pennsylvania Chronicle and Universal Advertiser* on April 18, 1770, offered a reward of $20.00 for 'two German servant lads run away,' and described as 'Jacob Stenger, aged eighteen years, five feet, eight inches, well set, good countenance, light complexioned, dark hair, and John Kindiel, seventeen years, five feet, three inches, old look, freckled face, black hair, thin long visage, of a slender make.'

"The incident is of interest in connection with the early history of American glassmaking—in that Jacob Stenger was one of the Stenger Brothers who, in 1775, started the first glass plant that has survived to the present day—the factory which is now running as the Whitney Glass Works at Glassboro, N. J., and where amid an orderly but clangorous turmoil, thousands of bottles are turned out per day, by batteries of automatic machines. One wishes that Richard (Wistar) and his runaway servant lad could stand for a moment before one of these clanking monsters; could watch its sixty bottles a minute lifted from its opening molds by its ghostly steel fingers, and thus see with their astounded eyes what America has done by encouraging her own manufacture."

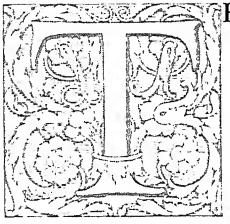
The name Whitney Glass Works was perpetuated until 1918, when that company was absorbed by The Owens Bottle Company, of Toledo, Ohio. In the meantime the plant has been equipped with Automatic Bottle Blowing Machinery, and an additional plant was erected, equipped in a similar manner.

From a plant originally operated under the crudest circumstances, depending on a supply of pine wood for fuel, has developed a plant second to none.

As the purpose of this book is largely to illustrate the bottle manufacturing development of the past, reference will not be made to factories of recent development other than those of The Owens Bottle Company and its licensees.

Chapter II

HISTORY OF ANTIQUE FLASKS AND BOTTLES



HE story of antique bottles is one of absorbing interest. During the first seventy years of the nineteenth century, fancy pocket flasks and bottles were made in the United States. During this period of development, colors and sizes varied too much to be a real test of age. The scarred base and sheared neck are the surest test, the older shapes having the neck sheared with scissors, leaving it irregular, and on the base, a rough circular scar left by breaking the glass from the pontil or iron rod, which held the bottle while being finished by the workman.

Smooth and hollow bases were made between 1850–1860, by means of a "snap" or case, which held the bottle while finishing, at which time a ring or band was added to the mouth.

Twenty-nine known flasks bear ornaments of an American Eagle, nineteen bear ornaments of the head of Washington, and twelve bear ornaments of the head of Taylor.

With the passing of time shapes varied. The earliest were slender and arched, with edges horizontally cor-

rugated. Then came oval shapes, with edges ribbed vertically. The next pattern was almost circular in form, with plain rounded edges. These were followed by the calabash or decanter form, almost spherical, with edges showing vertical corrugations, or fluting, with long slender neck finished with a cap at top, and having a scarred base.

These were superseded by bottles arched in form, deep and flattened having vertical corrugated edges, a short broad neck, finished with a round and narrow heading, and a base either scarred or flat.

The last development of all was the present modern flask. Interesting among the old American bottles are the Kossuth and Jenny Lind flasks. These were all made about 1848. One of Taylor's has Taylor's Historic Command, at the battle of Buena Vista—"A little More Grape, Capt. Bragg;" another has Washington on one side and Taylor on the other, with the motto, "General Taylor never surrenders." The last is of the circular canteen shape.

One of the oldest forms known to have been decorated in this country, is the one bearing the design of the first railroad, represented by a horse drawing along rails a four-wheeled car loaded with cotton bales and lumps of coal, and probably refers to the opening of the

Baltimore & Ohio Railroad Company in 1830, then a line fourteen miles long. This picture runs lengthwise, and bears the legend "Success to the Railroads" about margin of panel. Some of the Washingtons are of earlier date.

The log cabin designs are connected with the Harrison "hard cider" Campaign of 1840. These dark brown and green whiskey bottles in shapes of log cabin (Booz) are souvenirs of this date. They were made in New Jersey by the Whitney Glass Works for a Philadelphia distiller named E. C. Booz.

It is especially interesting to note that these bottles were promptly referred to as "booze" bottles. Their introduction by E. C. Booz in 1840 is intimately connected with the tradition of the initial use of the word "booze" in the vernacular. The phrase so commonly heard in American life up to July, 1918—"I'll take some booze," and which indicated a drink of whiskey—descended directly from the original Booz bottles.

Booz was active in the Presidential campaign of William Henry Harrison, of 1840, and had bottles for his whiskey made in the form of log cabins, the Harrison symbol. These bottles were eight inches high and supposed to hold one quart. At a recent sale of a curio collection in New York, two of these bottles sold for $28.00 and $30.00, respectively.

The Jackson bottles belonged to the period of the "stormy thirties." On them the "Hero of New Orleans" is represented in uniform with a throat-cutting collar, which entirely obscures the ears.

In the later sixties, a Connecticut firm sent out a bottle of modern shape decorated with a double headed sheaf of wheat, with a rake and pitchfork, and having a star below.

About the same time a manufacturer in Pittsburgh put out a highly decorated flask, similarly modern, having on one side an eagle, monument and flag; upon the reverse, an Indian with bow and arrow, shooting a bird in the foreground, and with a tree in the background.

Other bottles of unknown origin were decorated with horns of plenty, vases of flowers, panels of fruit, sheaves of wheat, a masonic arch with emblem, a ship with eight-pointed star and a bold Pike's Peak Pilgrim with staff and bundle, the latter to commemorate the passage of the Rocky Mountains.

There were also numerous fancy designs—decorations of animals, fish, eggs, birds and even pickles.

Of these antique examples, many are extremely rare. All of the better known types are quite valuable. For instance, at the New York sale referred to, a Jenny Lind bottle sold for $18.00.

The bottles described and illustrated in this work are but a few of those from the collection. They are, however, sufficient to furnish a clear idea of the character of bottles made during the early part of the nineteenth century.

The late Professor Barber, Curator of the Department of American Pottery and Porcelain of the Pennsylvania Museum, was for many years a collector of curios, old and historical designs in glass ware, flasks and bottles. His untiring efforts covering years of research made possible the identification of the early products of American Manufacturers. The completeness and authenticity of this story are due to the research of Professor Barber and to his courtesy in allowing the use of his data.

Illustrations and descriptions of examples are from the collection of the author, William S. Walbridge, of Toledo, Ohio.

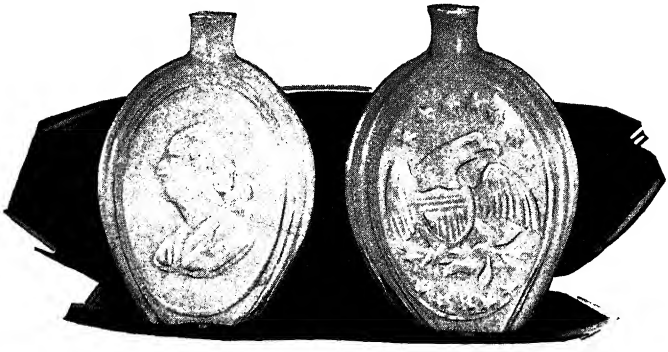


Figure 1

Light Green Flask, Bust of Washington on one side. Reverse, American Eagle with shield on breast, and twelve stars, seven above eagle and five below, with corrugated edges. Maker unknown.



Figure 2

Dark Amber Flask, EarlyAmerican, Made at Keene, N. H. Masonic arch with Emblems. Reverse, Eagle with shield over word "Keene" in oval. Sheared Mouth, Type VI (Barber). Period, about 1820.



FIGURE 3

Amber Flask, Early American (Unknown) American Eagle (Arms of U. S. A.) with scroll in beak. Sheared Mouth. Period, probably about 1820.



Figure 4

Dark Green Flask, Early American (Unknown); Probably, Coventry, Conn. Horizontally corrugated edges; Sunburst on both sides; Sheared Mouth. While not described by Barber, it bears relation in color and type only with corrugated edges similar to other Coventry Bottles. Period, probably previous to 1820.



FIGURE 5

Light Green Flask, Bust of Taylor. Inscription, "Rough and Ready." Reverse, Bust of Major Ringgold. (Dyottville Glass Works, Pa.). Period, about 1848.



Figure 6

Dark Amber Flask, Early American. Star with eye in center, letters "A.D." Reverse, Star with raised arm in center and letters "G. R. J. A." Sheared Mouth. Period, about 1820.



FIGURE 7

Dark Amber Flask, Bust of Benjamin Franklin. Reverse, Bust of T. W. Dyott, M.D. Inscriptions around edge, "Where Liberty Dwells, There is My Country." "Kensington Glass Works, Philadelphia." Period, 1833 to 1837.



Figure 8

Light Green Flask, Bust of Washington in uniform. Reverse, Bust, probably General Taylor. Inscription, "Bridgeton, N. J." Period, 1848. (Joel Bodine & Sons).



Figure 9

Light Green Flask, Early American. Flattened Pear Shape, Corrugated Lines follow lines of Flask. Sheared Mouth. Maker or Period, not known.

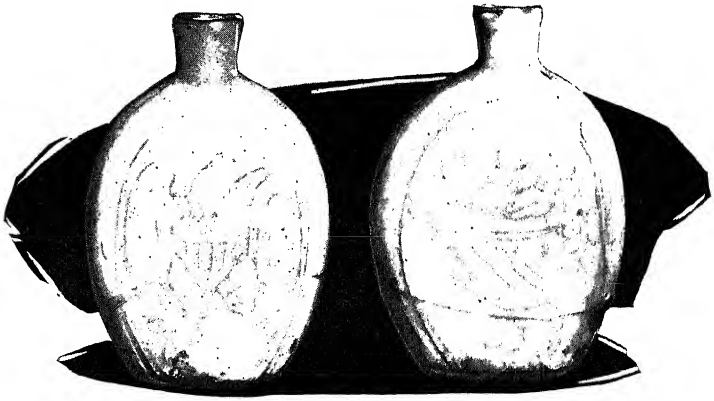


FIGURE 10

Light Green Flask, Cornucopia or Horn of Plenty with Fruits. Reverse, Eagle with wings extended with shield on breast. Sheared Mouth. Period, 1833 to 1840.



FIGURE 11

Dark Amber Flask, Horse and loaded wagon on rails (lengthwise). Inscription, "Success to the Railroad." Reverse, the same. Sheared Mouth. Period, 1833 to 1837. Maker, Kensington Glass Works, Philadelphia, Pa.



Figure 12

Light Green Flask, Bust of Lafayette with name. Reverse, Eagle and "E Pluribus Unum," with "T. W. D." (T. W. Dyott) in circle. Lettering around edges, "Republican Gratitude" and "Kensington Glass Works, Philadelphia." Sheared Mouth. Period, 1833 to 1837.



Figure 13

Dark Amber Flask, Cornucopia or Horn of Plenty with Fruit on both sides. Sheared Mouth. Period, 1833 to 1837. Maker unknown, probably Kensington Glass Works, Philadelphia.

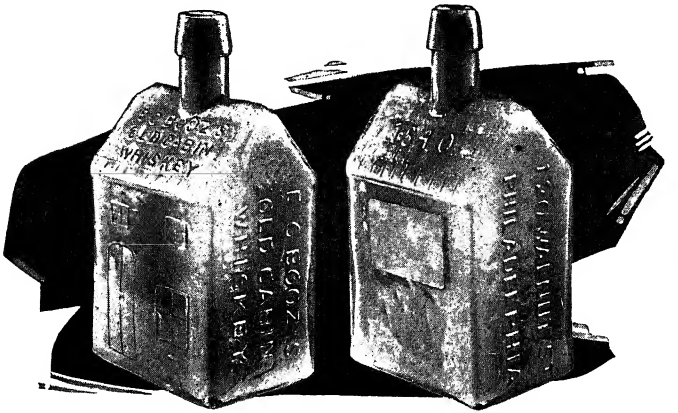


Figure 14

Log Cabin Whiskey Bottle, (Dark Amber or Green Glass). Moulded in shape of cabin. Inscription on one end, "120 Walnut St., Philadelphia." Date, "1840" on front of roof. On back, "E. C. Booz's Old Cabin Whiskey." Period, 1840. (Whitney Glass Works, Glassboro, N. J.).



Figure 15

Green Glass Bottle, (Calabash Shape). On one side, Fisherman wearing high hat, house in distance. Reverse, Gunner in high hat shooting birds, two dogs at his feet. Period, 1850. (Whitney Glass Works).

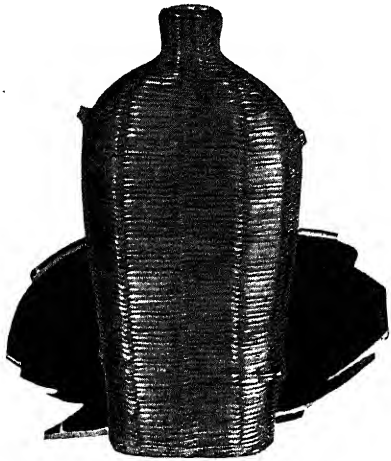


Figure 16

Flask, Early American, with wicker covering. Obtained at Shaker Village, Lebanon, N. Y. Sheared Mouth. Period about 1820.

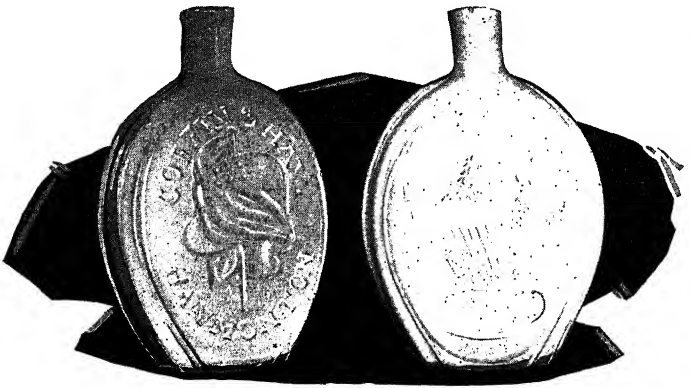


Figure 17

Light Green Oval Flask, American Eagle with shield on breast, standing on Oval Medallion, with Olive Branch and Arrows in Talons. Reverse, United States Flag and Inscription, "Coffin & Hay, Hammonton." Sheared Mouth. Period, 1838.



FIGURE 18

Light Green Oval Flask, Bust of Washington on one side. Inscription, "Father of his Country." Reverse, Bust of Taylor. Inscription, "Gen. Taylor never Surrenders." Sheared Mouth. Period, 1848-49. (Dyottville Glass Works).



FIGURE 19

Light Green Flask, Early American (probably Coventry, Conn.). Horizontally corrugated edges, Sheared Mouth, Eagle holding arrows in talons on both sides, with fourteen stars above eagles. Found in Perrysburg, Ohio. Probably brought by settlers from Connecticut. Period, previous to 1820.



Figure 20

Light Green, Oval Shape. On one side, Pike's Peak Pilgrim with bag over left shoulder and staff in hand. Inscription at top, "For Pike's Peak," and below, "Old Rye." Reverse, American Eagle. Inscription, "Pittsburgh, Pa." in circle. Period, 1850 to 1860.

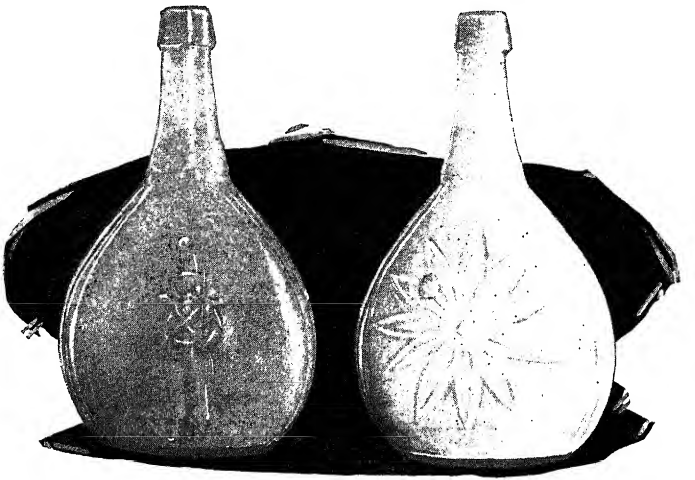


FIGURE 21

Light Green, Calabash Shape. On one side, Soldier with gun, high hat, crossed belt and epaulets. Reverse, Star. Period, 1848 to 1850. (Whitney Glass Works).

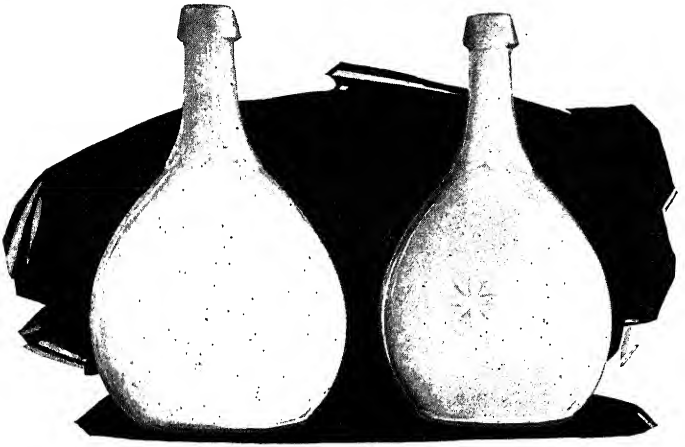


Figure 22

Light Green, Calabash Shape. On one side, Sheaf of Wheat, Crossed Pitchforks and Rake with Wreath. Reverse, Star. Period, 1850. Probably Whitney Glass Works.



Figure 23

Light Green, Calabash Shape. American Eagle, Scroll, Shield and Arrows. Initials, "A.R.S." below. Reverse, Clasped Hands; Square and Compass in large Shield; Thirteen Stars above. Period, 1855. (A. R. Samuels, Maker, Philadelphia, Pa.).

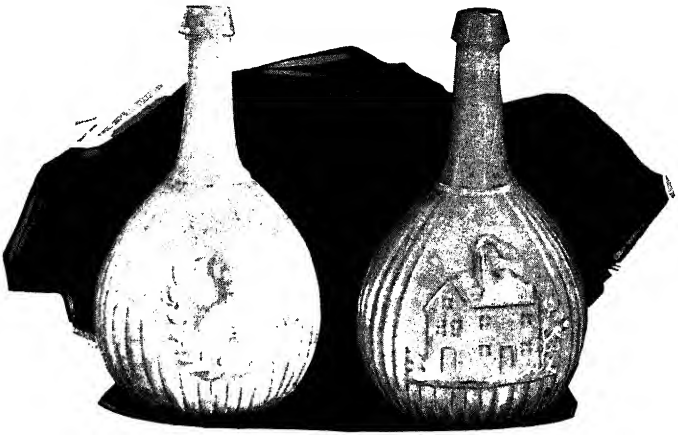


Figure 24

Light Green, Calabash Shape. "Jenny Lind" (Bust) in wreath. Reverse, Glass Factory, no inscriptions. Period, 1850 to 1852. Probably Whitney Glass Works.

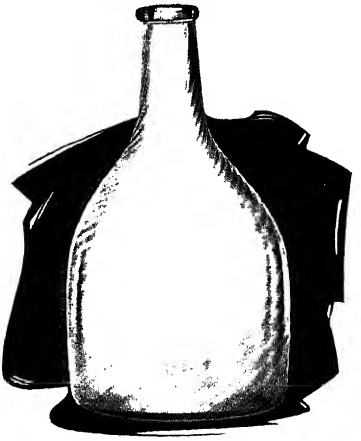


FIGURE 25

Light Green, Calabash Shape. Twirled glass, with pushed-up bottom. Period about 1850.

Further referring to antique bottles, it may be interesting to call attention to some bottles found by the writer on a visit to the Plant of the Whitney Glass Works several years ago.

At this time, an old storage building was about to be torn down, and amid the dust and general accumulation of odds and ends incident to a long business career, a variety of bottles were rescued and added to the collection.

These bottles are not such as are ordinarily sought after by collectors, but as they are typical of bottles manufactured previous to 1860, they serve in comparison with those of the present day.

In connection with these bottles, it is observed that the general line of bottles now used for prescription and preserving purposes was apparently not in existence. The greater variety of bottles used for medicinal purposes were more in the line of patent and other remedies; and those for preserving were incidental to the housewife, and not for packing purposes by the general trade.

Indeed, it may be said that previous to 1860, but little attention was given to preserving fruits and vegetables other than by a drying process. Not until 1857, the date of the advent of the Mason screw top



PRESERVING JARS, OLD STYLE
(*Whitney Works*)



MEDICINE BOTTLES, OLD STYLE
(*Whitney Works*)

jar, the only method was by sealing a jar by any process which happened to appeal to the housewife.

All of these bottles show the rough punty marks on the base, many of them being made in soapstone moulds, and the majority have thin tooled lips.

In the medicinal line, it is apparent that our forebears were attracted to the proprietary preparations as much as at the present day. Hair Dyes, Catarrh Snuffs, Cough Syrups, Lotions, Nervous Pills and Castor Oil were notable preparations prevailing at that time. Ink Bottles in the old-fashioned shape, with quill inserted, belong in this period. Other shapes, less famous, were also manufactured.

Many of the names blown in the bottles may be familiar to some of our older friends. For example: D. S. Hart, New York, Sugar Coated Nervous Pills—"Bonum de Superb;" Macassar Oil (London) "For the hair;" H. W. Seat, M. D.—Negative Electric Fluid; Dr. Marshall's Catarrh Snuff; Deshler & Boggs, White Mustard and Rush's Syrup; Daniel Goddard, New York, New England Cough Syrup; Dr. B. Olens, New York, Life Bitters, and many others whose names have passed into obscurity.

We are showing a few of the varied shapes made by the Whitney Glass Works during the period previous



Baltimore Monument



Toby Bottle



Domino Bottle



Russian Kimmel



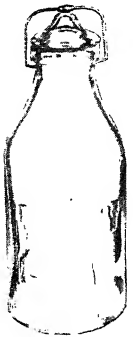
Moses Smiting the Rock



Indian Bitters

A FEW OLD FREAK BOTTLES

to 1860. These old bottles, when compared with bottles of the present generation, clearly illustrate the development in this line.



One of the Original Milk Bottles

The advent of the sanitary milk bottle of to-day is comparatively recent history. While there is at this date an annual production of approximately 160,000,000 milk bottles—a greater part made on Owens machines—the original milk bottle came into use within the past quarter of a century.

The milk bottle shown here is supposedly one of the original specimens. It was found in Ogdensburg, N. Y., and it is said that the party for whom it was made paid Dr. Thatcher, of Potsdam, N. Y., $100 for the privilege of using these bottles in Ogdensburg. In addition to that, the regular price of $12 per gross was paid. The design on the side of the bottle is believed to represent—"Dr. Thatcher, milking a cow."

This information, as well as the bottle, was furnished by the Thatcher Manufacturing Company, of Elmira, N. Y.

In closing our story of old bottles, we cannot overlook some interesting novelties in shapes. We show these, not with any idea of historical value, but that

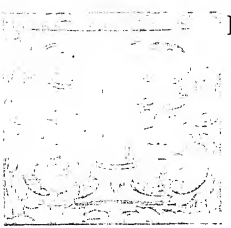
one may note the changes of ideas that have developed.

Many other bottles not shown are in the author's collection. Sufficient number, however, have been illustrated to give the reader a knowledge of the past and an opportunity for comparison with the present.

In collecting these bottles, the author has enjoyed his experiences, which have covered a period of many years, and in writing their history, recalls the many incidents of obtaining them with keen pleasure.

Chapter III

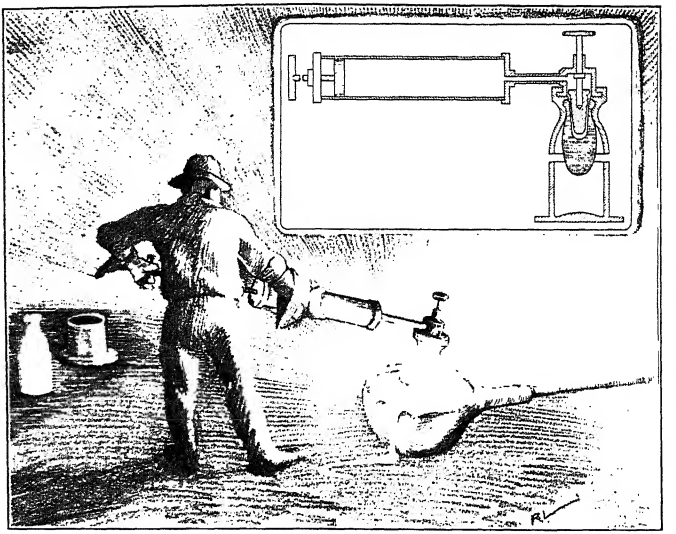
INVENTION OF THE OWENS BOTTLE MACHINE



THE story of the Owens Bottle Machine reads like a tale from the Arabian Nights. This machine was the invention of Michael J. Owens of Toledo, Ohio. Previous to this machine, other inventions of Mr. Owens were successfully utilized in the Glass Industry. Prominent among them was a semi-automatic machine for the manufacture of thin blown tumblers, chimneys and similar ware. At present the Macbeth-Evans Glass Company, of Pittsburgh, is extensively using the semi-automatic in its various factories, including the former plant of The Toledo Glass Company and the American Lamp Chimney Company.

Mr. Owens and the author were employed by the American Lamp Chimney Company, and it was following its absorption by the Macbeth-Evans Interests, that Mr. Owens realized that entirely automatic, instead of semi-automatic methods, were essential in the industry. He began experiments in this direction in 1899.

Up to this time, no entirely automatic process had been conceived. From the beginning his efforts were



The Original Owens Process

The basic invention of the Owens Bottle Machine is fixed on this crude vacuum device. The story fully describes the method of operation.

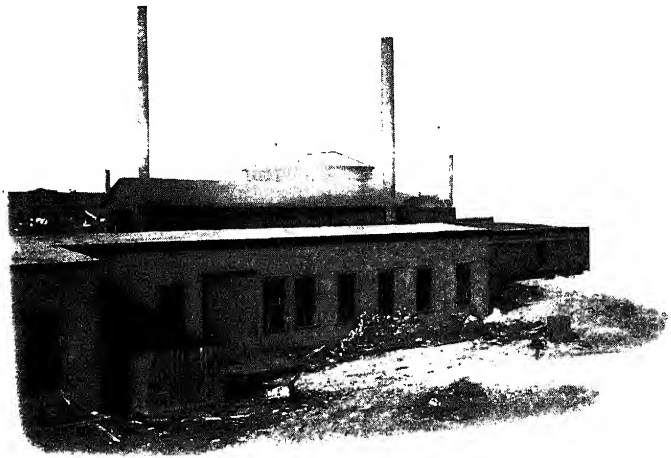
completely novel, feeling his steps gradually, often meeting with disappointment. Success, however, finally crowned his work.

His first attempt on which the fundamental or basic invention is fixed, resulted in a crude device for gathering by suction into a two-part iron mold, a solid mass of glass from a pot of melted glass. The upper part of the mold completely formed the neck and lip of the bottle around a plunger, the plunger being inserted through the top of the parison or solid mass of glass in the mold.

The next process was to open the lower mold. This permitted the parison suspended by the neck in the upper mold to be placed in the finishing mold. The finishing mold was similar in shape to the bottle to be blown. By reversing the piston in the cylinder, air was forced in an opposite direction to that used in gathering the glass, and the parison was expanded in the mold and blown into form.

On the page opposite we have illustrated the process that was described above. This shows the original automatic gathering device and the method of operation.

This description makes the operation appear simple, yet it was several months before a finished bottle could be made.



The Original Owens Factory

This small frame building with a glass-house at one side was the first Owens factory, and was situated on the site of the Owens Bottle Company's present plant at Toledo.

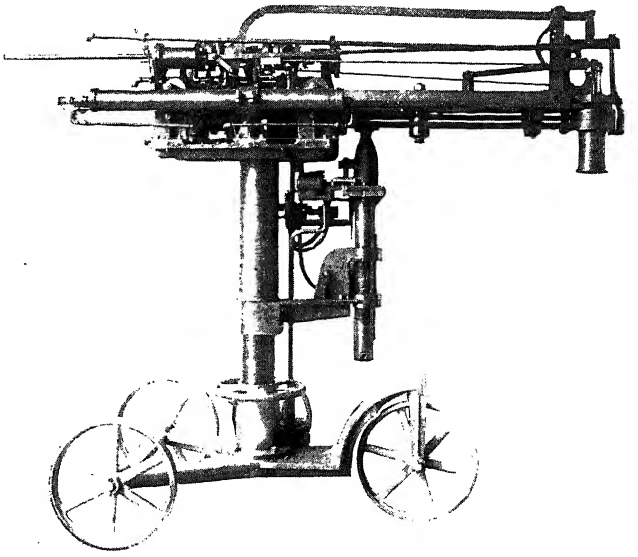
Up to this time, the experiments had been conducted solely by Mr. Owens, assisted by Mr. W. E. Bock. Under Mr. Owens' direction, the gathering device had been constructed. From this time forward the expense of experimentation was taken over by The Toledo Glass Company.

It is interesting to know the officers of The Toledo Glass Company, as these men figure throughout the history of the Owens machine, later becoming interested in organizing The Owens Bottle-Machine Company. These officers were—President, Edward D. Libbey; Vice-President, Clarence Brown; Secretary, Frederick L. Geddes; Treasurer, William S. Walbridge; and General Manager, M. J. Owens.

The Company at once engaged W. E. Bock as engineer, under the supervision of Mr. Owens, to construct an experimental machine. In the meantime, the Company began the construction of a small frame building on the site of the Owens Bottle Company's present factory in Toledo.

To supply the machine with the necessary melted glass, a small tank was also built. On its completion, the second experimental machine was tried out.

This machine was of similar construction, mechanically, as the original machine, except that it was mount-



Machine No. 2

This machine is similar in construction to the original device, except that it is mounted on an upright column, with a wheelbase to move the machine forward to and back from the glass pot.

ed on an upright column, with a wheel base to move the machine forward to and back from the glass pot in gathering. The finishing mold was attached to the column. After gathering the parison of glass, the mold containing the parison was drawn back to the opened finishing mold. Then the gathering mold was opened, the parison remaining suspended by the finished neck was inserted in the finishing mold. By forcing the air through the cylinder of the machine, the parison was blown into shape, as a bottle.

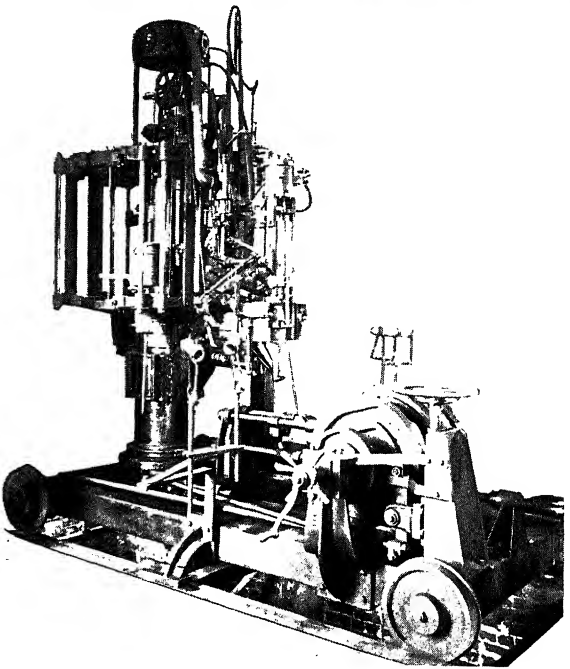


These Twisted Shapes are the First Attempts to Make Bottles by the Vacuum Device

The progress made at this point may be recognized by a glance at the illustration of the machine.

Thus far the process was successful but not automatic. Mr. Owens proceeded to further develop his ideas of an automatic machine.

In the same building in which the machine was operated, a machine shop was equipped. Mr. Bock was in charge with C. W. Schwenzfeier, as assistant. Then started the construction of an automatic rotary machine, which embodied the processes thus far developed. In addition, a larger day melting tank was built to accommodate the machine.



Machine No. 3

This was the first rotating machine, and was very novel in construction. It was for the requirements of this machine that the revolving glass tank was developed.

This tank was novel in its construction, being built with an extension or bay on the front, permitting the glass to flow outside of the interior of the tank, thus facilitating the operation of the machine in gathering the glass.

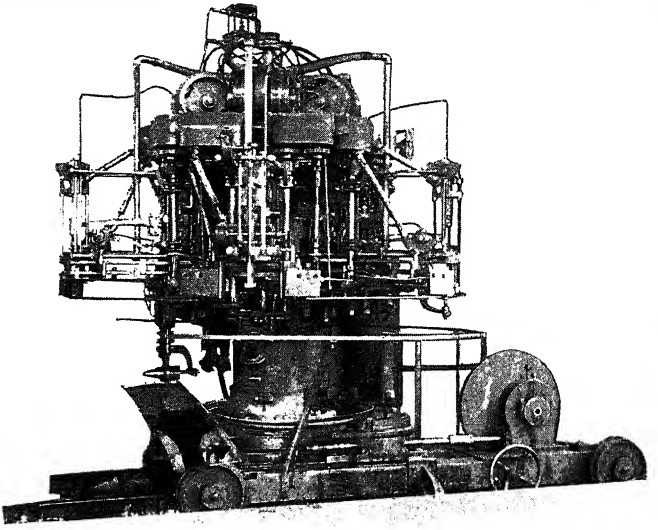


Experimental Bottle Made on Machine No. 2

The machine, as originally designed, was to have a series of arms carrying the gathering and finishing molds. It was intermittent in its action, the intent being to have the machine stop at the point of gathering its charge of glass. After making its gather, it passed on to permit the following mold to continue in the process by the same method.

The gathering mold, after completing its work, deposited its parison in the opened finishing mold and the bottle was automatically blown.

As tested out, the machine had but one complete gathering and finishing mold. The trial demonstrated that it was impossible to continue gathering glass at a fixed point. The molten glass became chilled by the process and Mr. Owens at once began experimenting to overcome this difficulty. After many experiments, the rotary tank was developed. It was a basin into which the melted glass from the refining tank flows continuously. This tank revolved in conjunction with



Machine No. 4

This machine was the outgrowth of the great encouragement Mr. Owens received from the operation of No. 3, and at the time it was built was considered a marvelous specimen of engineering skill.

the machine, supplying a fresh surface of glass for gathering. This method overcame the chilling of glass at the gathering point.

Many other novel features were embraced in the construction and operation of the revolving tank. These formed the basic principles of successfully bringing glass outside of a glass tank, in combination with an automatic machine for the manufacture of hollow glass articles.



Bottle Made on Machine No. 3

The success attained encouraged Mr. Owens to continue further developments and to redesign the machine. At the same time, it was an incentive to The Toledo Glass Company to build a glass factory with a furnace embodying the revolving tank to accommodate the new type of machine when completed.

The new machine had many improvements over any previously built, and at the time of construction was considered a marvel of ingenuity.

As completed, the new machine had an equipment of six arms, carrying six gathering and six finishing molds. Approximately three years after beginning the original experiments, this machine was installed in The Toledo Glass Company's factory in Toledo for trial.

Looking back over the intervening time, and the marvelous changes brought about since this trial, one can scarcely conceive what this climax of developments forecast for the glass industry of the world.



Bottle Made on Machine No. 4

In the early history of glass making—and this we are told by Frederick Wm. Hunter, A. M., in his history of Stiegel Glass, antedates the making of history—the first invention being recorded was that of the blowpipe, during the second or third century before Christ. This blowpipe was imported by the Egyptians from Asia Minor. At the time when the Romans conquered Egypt, they brought the blowpipe home with them as one of the trophies of war. From those early days to this time comparatively slow advancement was made in the process of glass making, with reference to blown glass in particular.

An example of a bottle found in an Egyptian tomb and brought from Egypt by the late Wm. Franzen, of Milwaukee, was presented by his son to the author. This specimen clearly shows the same method of manufacture as do the bottles of early American factories up to 1840.

This bottle has the rough marks of the pontil or "punty" on the base, the same sheared lip and is decorated with figures similar to those of the flasks of early American make.

From the sheared lip to the laid-on ring in the early 40's of 1800, the use of a snap to take the place of the pontil in finishing a bottle, through the early 80's, but little advancement was made. At this latter period began changes by mechanical means, semi-automatic in nature, until Mr. Owens, at the trial of the machine we have referred to, broke through the barriers and established an historical epoch in the glass industry of the world.

The trial of this machine and tank thoroughly demonstrated that blown articles of glass could be successfully manufactured automatically, and an intense interest was created throughout the glass world.



Egyptian Bottle Probably 2,000 Years Old

To further develop the machine and enlarge the scope of its business application, The Owens Bottle-Machine Company was organized in 1903, with a capital of $3,000,000. The newly formed company took over the plant of The Toledo Glass Company and the American rights on all inventions, the purpose being to man-

ufacture glass articles and to license others to use the machine and inventions controlled by it.

It is interesting to read here of the impression made by the Owens Machine upon the late Frank M. Gessner, editor of the *National Glass Budget* of Pittsburgh, Pa., in August, 1903. Mr. Gessner visited the Toledo plant to investigate the machine. His impressions are quoted in brief from a long article written by him after his visit.

"The Owens machine stands in a class unapproached by other inventors. It differs radically and fundamentally from all other machines in several important and epoch-making features, because it gathers its glass, forms its blanks, transfers the blank from the gathering mold to a blow mold with a finished lip and ring, blows the bottle and delivers the finished bottle automatically without the touch of the human hand, eliminates all skill and labor and puts the same amount of glass into every bottle, makes every bottle of the same length, finish, weight and capacity, it wastes no glass, uses no pipes, snaps, finishing tools, glory holes, rosin, charcoal, and requires neither gatherer, mold boy, snap boy nor finisher and still makes better bottles, more of them than by any other process.

"The Owens machine settles completely the problem of mechanical bottle and jar production, lowers the

cost to a vanishing point and cannot fail to revolutionize the industry, displace the can as a fruit package and by providing a cleaner and cheaper vessel will greatly increase the use and demand for glass bottles and packers."

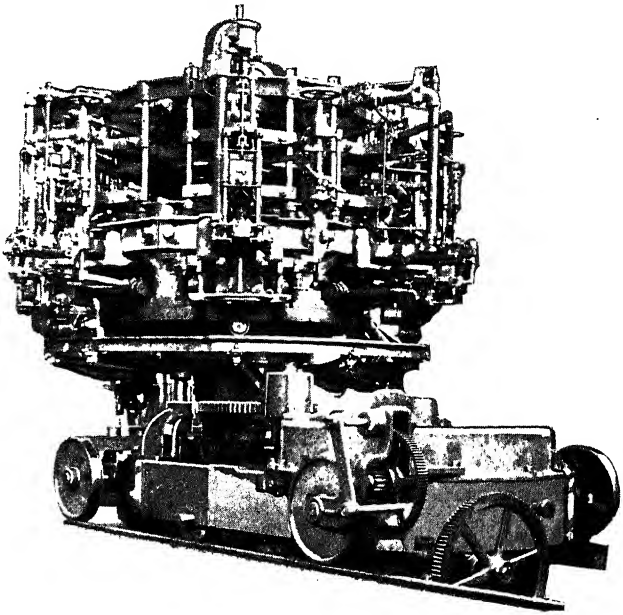
In this year, 1920, could Mr. Gessner realize how prophetic had been his statement, he would be even more surprised at the progress made.

At the time of Mr. Gessner's visit, the Owens Company guaranteed a production of nine pint and quart beer bottles per minute, or 12,960 bottles per machine per day. How small this output appears in comparison with the production of the most recent type of machine will be fully illustrated later in the story.

The progress from this time forward has been one of continued development and efficiency.

American manufacturers were the first to realize that the Owens invention predicated a revolution in glass bottle manufacturing, and visitors came from all branches of the industry to the Owens plant, so that they might inspect and examine the machine.

Manufacturing experiences made new and vital improvements in the machine necessary. Some changes, in fact, were so radical at times as to force the abandonment of many of the older types already in use. The scope of the machine's usefulness was greatly in-



Machine No. 5

This machine shows a great improvement over No. 4. It formed the foundation for the general type in use at the present day.

creasing, however, which in all instances justified the hard work and patient experimentation.

It was not, however, until the following year that the Owens Company felt justified in making arrangements to install machines in other factories.

In the meantime, a new type of machine was developed, displacing many of the features of the machine first installed, and it may be said that this was the ultimate experimental development that formed the foundation for the general type in use at the present day.

Both in appearance and efficiency, a great advantage over Machine No. 4 was shown.

This machine had a series of fixed arms, carrying the gathering molds, which required raising and lowering of the entire machine by counter-weights in the process of gathering. Meanwhile, the intermittent features of stopping the rotation of both machine and revolving tank in gathering the glass were discontinued. The gathering mold, while the machine was revolving, was arranged to dip into the surface of the glass in the tank when taking up its charge. This change allowed the increasing of the speed of machine, and increased the quantity of bottles made.

The improvements and efficiency of the machine now warranted its introduction into other factories, and rapid installations were made in plants of the

Thatcher Manufacturing Company, Manufacturers of Milk Bottles at Kane, Pa., The Ohio Bottle Company (Afterwards The American Bottle Company) at Newark, Ohio, as well as at The Northwestern Ohio Bottle Company, West Toledo, Ohio, and The American Bottle Company at Streator, Ill. These installations covered a period of from 1904 to 1906.

Chapter IV

THE OWENS MACHINE IN FOREIGN COUNTRIES



TTENTION was also given foreign countries by The Toledo Glass Company, the patent rights being disposed of for Mexico and Canada; and in 1905 a company, called The Owens European Bottle-Machine Company, was formed to operate in all foreign countries outside of North America. This company was also officered by the same men as The Owens Bottle-Machine Company, of the U.S.A., but was a distinctive corporation.

It may be well to follow the history of this Company briefly, and then return to the story of the machine in American Industry.

The initial commercial and demonstration plant was erected on the estate of Sir Humphrey D. Trafford—at Trafford Park, Manchester, England, in 1906–07.

This first enterprise was under the management of William H. Boshart, of Toledo, later Vice-President and General Sales Manager of The Owens Bottle Company; and its initial operation was conducted by Mr. Owens. This plant was successfully operated in supplying the English trade.

About the same time, a plant was erected and operated for the Apollinaris Company at Rheinahr, Germany, for the manufacture of 20,000,000 bottles per annum.

The water bottled by the Apollinaris Company is from a natural carbonated spring at Neuenahr, Germany, a short distance from the bottle plant, and is owned by an English company with offices at London.

This plant was constructed and machines installed under the direction of Messrs. Owens, Bock, and Schwenzfeier, and has been in constant operation, except during the period of the World War. Operations were resumed immediately after the war.

To return to the plant at Manchester, England—the operation of this plant met with the same success as that of the Owens' installations in the United States. Manufacturers from Germany, France and other foreign countries came to investigate its operations, with a result that the entire European rights, outside of the Apollinaris Plant, including rights for Cuba, South America, Africa and parts of Asia, were disposed of to a syndicate of European manufacturers for 12,000,000 Marks. This sale also included the Manchester Plant.

It is particularly interesting to note the impres-

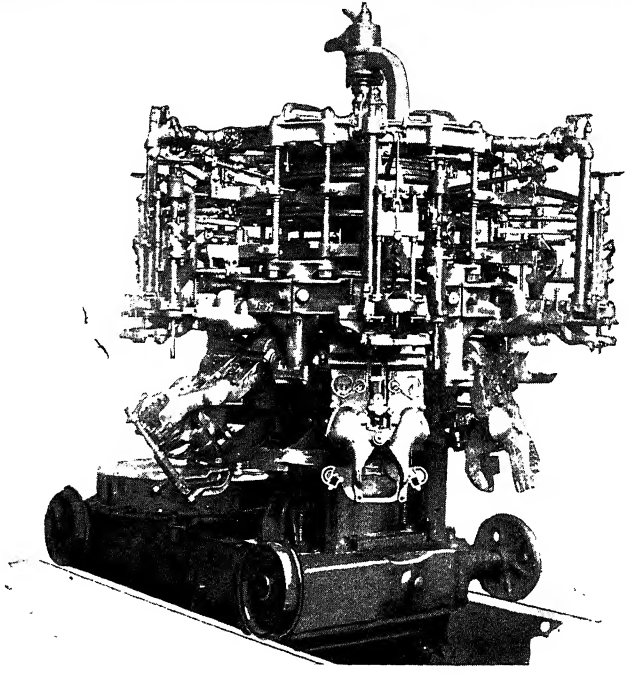
sions which this marvelous development in the manufacture of bottles made on the other side of the Atlantic.

In London *Truth* of December 11, 1907, the following article appeared, referring to the Apollinaris Company's installation at Rheinahr, Germany:

"Certainly, of all the evil looking machinery I have seen—and I have been privileged to see a good deal in my time—I have never seen any which gives so exactly the appearance of an angry—even malignant—idol.

"I dare swear that if Arminius or any other of the old-time gods of the Ahr Valley were to have seen it, they would have prostrated themselves before it as a worthy supplanter of their former gods, and within an hour or so would have been offering human sacrifices, too, in its honor.

"Probably the god whom of all Mythology it most really suggests is 'Briareus,' he with the hundred arms, (was he a god, by the way?) for the first impression of the great mass of metal looming up over your head is that it is stretching out a hundred steel arms to clutch you by the throat. When the engineer in charge, who, in his enthusiasm, might well pass for a priest of the idol, sets it in motion for you, your fears change to admiration, so wonderful a piece of mechanism is it for the human brain to have invented.



Machine No. 6

No. 6 Machine marks a step towards increased mechanical efficiency, and was rapidly introduced into factories during the period of from 1904 to 1906.

"I have neither the inclination nor the capacity to describe it in detail—suffice to say that it performs the whole operation of bottle-making from the beginning to end, without once calling for human intervention. It even dips the molten glass out of the furnace with one pair of steel hands, with them crams it into the molds, which may well represent its maw, retreats with it from the furnace as might a dog that has snatched a bone; molds it, blows it and tempers it, and who knows what besides, finally delivering the finished bottle to its expectant attendant as though, having sucked the warm marrow from the bone, it was content to resign the empty covering to others."

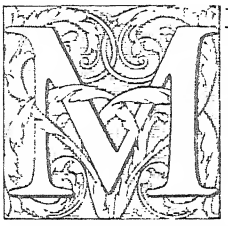
Another description, quite similar to the above, was written by English observers of the machines in operation at Manchester, England, and the concluding remarks are certainly worthy of mention. After describing the various operations, one English friend remarks, "'Take it'—'Thank you'—'Take it'—'Thank you'—is how the action of the machine may be represented in speech, as a bottle is handed out every few seconds, and the machine continues going around gracefully doing its work."

To conclude briefly the foreign situation, it might be stated that since the disposal of these rights, in-

stallations have been made and are in operation in England, France, Germany, Holland, Sweden, Cuba and South America, and later, the Owens European Company disposed of its Japanese rights and installed a plant in Japan with the latest types of machines and equipment.

Chapter V

FURTHER DEVELOPMENTS IN THE UNITED STATES



EANWHILE, the developments in the United States were of no less importance. Following the installations of the period 1904 to 1906, Owens Machine equipment was put in the plants of the Hazel-Atlas Glass Co., at Washington, Pa., and Clarksburg, W. Va., The H. J. Heinz Co., Sharpsburg, Pa., The Greenfield Fruit Jar & Bottle Company, Greenfield, Ind., (afterwards acquired by Ball Bros. Glass Manufacturing Company, of Muncie, Ind., and manufacturing transferred to that city by them), The Charles Boldt Company, Cincinnati, Ohio, the Illinois Glass Co., Alton, Ill., and the Whitney Glass Works, Glassboro, N. J.—all the above plants being operated under license from the Owens Company—and covering a period from 1906 to 1911.

Continued development of the machine in mechanical construction and efficiency was carried on during this time by a department under the management of W. E. Bock and Richard LaFrance, Engineer, the latter succeeding Mr. Bock when he retired from the company's service to engage in personal affairs. The

principal features developed, was a machine for greater capacity of production, having ten instead of six arms, and showing a proportional increase in the number of bottles made.

It was during this period, in 1909, that the first prescription bottles, six ounce Ovals, were made at the plant of the Canadian Glass Co., at Montreal, Canada.

In the fall of 1909, the business was increasing so steadily that expansion became necessary for the Owens Company. A site was purchased near Fairmont, W. Va., contiguous to the gas and coal fields. Here the company began the construction of the most modern glass factory of the world, equipped with all the improvements at its command. This plant as projected was to have six furnaces, each equipped with two ten-arm machines, capable of a production of 50,000 gross per annum on each machine.

On November 3, 1910, this plant was inspected by the officers of the Owens Company, at which time it was under the management of Supt. Samuel S. Cochrane, later Factories Manager of the Owens Company.

The Fairmont West Virginian, a local newspaper, gave the following interesting report of this inspection visit:

"On reaching the factory, the inspection party and

their guests, after the temporary amazement wore off from looking over the many acres covered by this immense industrial plant, and listening to the hum of the machinery, interested themselves at once in the wonderful working machines, the invention of Mr. M. J. Owens, and which have completely revolutionized the bottle-making industry of the world.

"These wonderful, almost human, machines, beggar description, and even a detailed scientific description by an expert would not convey to the public the intricate mechanism necessary for their construction and operation.

"Each machine is composed of ten smaller machines, each capable of turning out a perfect bottle every few seconds, and these ten machines are assembled as one massive machine which continues to revolve, passing by a revolving tank of molten glass, kept always at an even temperature, which is sucked or picked up into the molds which continually revolve, passing the finished bottle on to an automatic carrier device, another Owens invention, where it is carried away to make room for the continual output of bottles."

The Fairmont plant has been in constant operation since its initial opening and still continues to remain

the model glass plant intended, as all later improvements have been added to keep it up to the highest efficiency.

In June, 1910, an interesting event took place at the Whitney Glass Works, Glassboro, N. J. The first attempt to manufacture commercially varied sizes at one time upon one machine was undertaken. The result was very successful.

The machine that accomplished this feat had six arms, and shapes produced were five squares and one oval. These included three weights, three heights and three capacities.

Another group consisted of four different weights, heights and capacities, three of these being prescription finish. Next were tried three "Blake" molds, five-ounce weight and capacity for stoppering, and three other "Blake" molds, four and three-quarter ounce weight, five and one-half ounce capacity, with prescription finish.

These developments were highly satisfactory, and established the fact that it was practicable to make bottles of varied sizes at one time on a single machine.

In the mention of installations, reference has been made to an automatic leer for annealing; also the invention of Mr. Owens. Before describing this invention,

the reader will be interested in understanding the methods of annealing at an earlier period.

At a meeting of the Junior Institution of Engineers of England held October 24, 1910, Mr. Bernard A. Kupferberg read a paper on the manufacture of glass bottles, and in referring to old methods, the subject of annealing was described as follows:

"The object of annealing stoves (Ovens) was to defer the cooling of bottles, and to prevent any uneven tension in their walls. They were built of fire-proof bricks of various shapes, and might be divided into two classes—the periodical and the continuous annealing stoves. The former were small stoves, heated either by gas or by direct fire.

"A small door was fitted in the front wall, and the chimney was built in the back; the latter drew the flames or the products of combustion across the stove, through the channels under the flooring, and into the atmosphere. When the stove was sufficiently hot to receive the bottles, the supply of heat was reduced, but still maintained the correct temperature.

"The bottles were carried from the furnace by boys, and laid on the flooring of the stove, from which the man in charge raised and arranged them in stacks by the aid of a long fork. When the stove was full, it was

closed and the heat gradually diffused in four to six days.

"The next stove which was being heated, whilst the first one was being charged, was then filled and so on,—with this system a large number of stoves was required. The continuous stove consisted of a long tube or tunnel, heated at one end and gradually decreasing in temperature to the other. It was filled with rails and small trucks or an endless chain arrangement on which the bottles traveled from the hot to the cool end.

"The temperature at the charging end should, as in the periodical stoves, be the same as that of the bottle when finished by the blower, varying from 1200 to 1500 degrees Fahr."

The above description applied to many of the installations in the old factories of the United States, at the advent of the Owens machines, with such changes as individual factories made to improve local conditions. Indeed, the author recalls the time when, with Messrs. Libbey and Owens, he visited a plant manufacturing beer bottles, to show the management some of the first beer bottles made on the Owens machine. The plant was that of The Reed Bottle Company of Massillon, Ohio, and here were seen bottles being annealed in large closed ovens by the same process as described

by Mr. Kupferberg. It was claimed by the Reed management that this was the old and preferred manner of annealing, for by this process bottles were less susceptible to breaking by atmospheric conditions or reheating, than by more modern methods.

In general, however, the continuous method as described in the latter part of the Kupferberg article was used, and it was this process that Mr. Owens' leer supplanted.

The annealing of glass is of greater importance than is ordinarily recognized by those not familiar with glass manufacturing.

The temperature of glass in the melting pot or furnace is from 2000 to 2500 degrees Fahr. In the process of manufacturing by the Owens machine, the temperature is at least 2000 degrees Fahr. at the point of gathering where the mold takes up its charge. As the machine revolves on an average of once in twenty seconds, and discharges the bottle into a spout, delivering it into a leer, this temperature has been reduced to approximately 1000 or 1200 degrees.

In the process of making a bottle, a skin or outside covering of the glass, shaped into a bottle, has been formed. The inner glass is still in constant action, because of the thousands of minute molecules, of

which it is composed. Were it not for the gradual reduction of the heat, permitting these molecules to move slightly among themselves, and thus relieve the strains previously introduced by sudden cooling, or by the violent stresses to which the glass had been subjected in its formation, the bottle or other glass article would be unable to stand the strain put upon it, and would fly to pieces.

In the annealing process, the time usually given to pass through the leer to the end where the bottle is taken off for selecting and packing, is from six to eight hours, the reduction in temperature being brought down to a "milk warm" point.

Up to this time of the Owens development, but little scientific methods were used in annealing, the leer being in charge of an attendant who occasionally looked into the end of the leer to satisfy himself as to the heat conditions, and if sleepy throughout the night, or indisposed, or from other reasons, it often happened that a large portion of the bottles were improperly annealed, and consequently of little value.

These conditions were recognized by Mr. Owens, and one of his first improvements was the introduction of pyrometers at different intervals on the leer to determine the heat relations and satisfy himself that a

gradual and not a rapid cooling of the glass was taking place.

Mr. Owens also introduced the automatic control of leers by electric motors to replace the old time method of pulling the leer pans by hand.

His next step was to make the leers automatic in place of hand controlled, so as to operate in conjunction with the bottle machine. Every movement of the leer was now synchronized with that of the machine.

When completed, this device consisted of a narrow series of sheet steel pans with inserted cups placed at regular intervals, the pan extending across the front of the leer. These pans were arranged so that there was a continual circuit through the leer and back again outside of the leer to a point opposite where the bottle machine operated, at which point it was indexed and worked under the finishing mold of the machine. As the bottle was completed and thrown out of the mold, it dropped into one of the cups in the leer pan, this pan automatically passing forward, and presenting another cup until the entire pan was filled, at which time it had completed its passage across the head of the leer, and was ready to make its passage through the leer.

While this process is going on, other leer pans are following in like manner so that no interval occurs—

the whole action of the operation being controlled by the bottle machine, regulated to the speed of production.

Without going into further details, we believe the reader will fully understand the greater advancement this invention made in the annealing process, completing as it does, the entire process of automatic bottle manufacturing.

Among the most interesting of developments of the Owens machine were in 1910. Reference has been made to an installation at Fairmont, W. Va., of ten-arm machines instead of the six-arm machines which were used up to this period.

The addition in the number of arms on the machine increased production proportionately, and production reports from factories showed up to twenty-three pint bottles per minute, or from 200 to 230 gross of selected bottles per day. Truly, a wonderful advance in six years, in contrast with the early machine of 1903.

The principal installations in the licensee factories occurred during the period designated—1906 to 1911. It was in 1910 that these notable installations were made; The Charles Boldt Company, of Cincinnati, Ohio, and the Illinois Glass Company, Alton, Illinois.

The report of President Libbey to the stockholders

of the Owens Company at its annual meeting, November 25, 1911, showed installations of 103 automatic machines, with eighteen additional machines on order and under construction. The total normal capacity of these machines amounted to 4,200,000 gross of bottles.

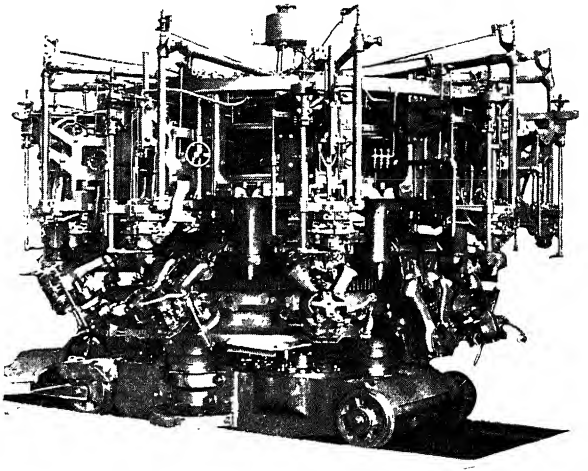
It was also stated that a new type of machine to manufacture Syphon bottles, (at this time manufactured entirely in Europe for the American market) and gallon jug packers, was under construction. Three other types of machines in use or under construction were also mentioned in Mr. Libbey's report. They were:

1. Machines to manufacture bottles from one-half-ounce to six-ounce capacity.

2. Machines to manufacture bottles from six-ounce to thirty-two-ounce capacity.

3. Machines for the manufacture of bottles as large as eight inches in diameter and seventeen inches in height, this latter being for larger sizes than heretofore made.

The automatic leer, of which a description has been given, was referred to as being an important and practically necessary part of modern Owens bottle-machine installation—and that its efficiency and economy had been fully demonstrated. The Owens Company were



The Ten-Arm Machine

This was the first commercial Owens Machine on which each arm operated independently. It greatly increased production and efficiency.

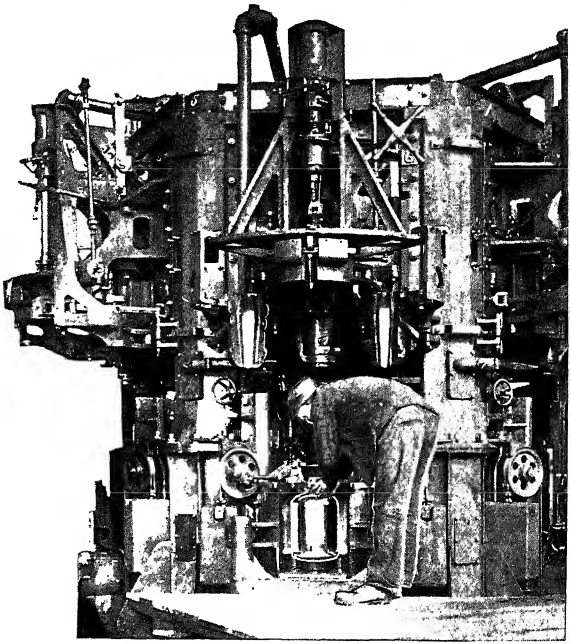
now installing the new type of leer in its own as well as the plants of its licensees.

In 1911, The Charles Boldt Company, a licensee, enlarged its Cincinnati plant, doubling its capacity, installing additional machines, and the Illinois Glass Company, at about the same time enlarged its installation to operate twenty-two machines.

In this same period, The American Bottle Company, the Thatcher Manufacturing Company and the Hazel-Atlas Glass Company, all licensees, made very extensive installations. The enthusiasm and active co-operation of the licensees of the Owens Company assisted materially in the progress made during this period. These companies were composed of men well grounded in the bottle business, and they contributed in a large measure to the success attained.

In May, 1912, the license to manufacture prescription and proprietary ware was granted the Owens Eastern Bottle Company, and a plant was built at Clarksburg, W. Va., with three furnaces and an installation of six ten-arm machines.

This new plant, which was then under the management of George W. Yost and James W. Morrison, was later acquired by the Owens Company, Mr. Morrison associating himself with the latter company as a Sales Manager.



The Carboy Machine

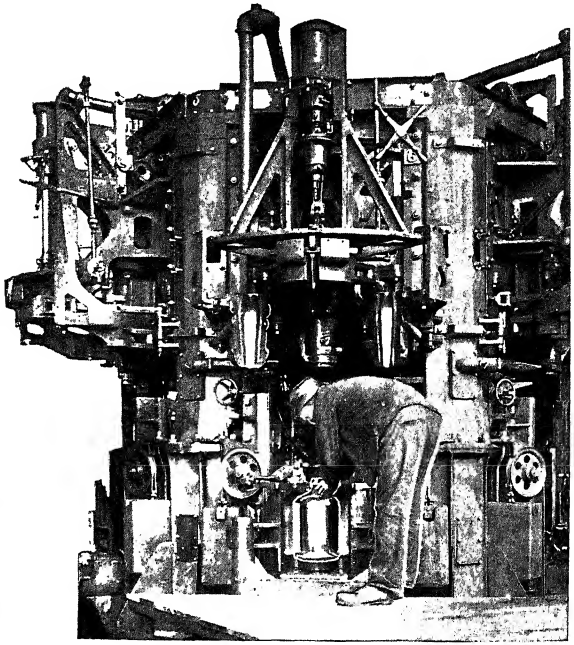
Probably no machine built by the Owens Company so graphically illustrates the marvelous advances made in Owens Machine construction.

It was in February of this same year, that the original factory of the Owens Company, at Toledo, was totally destroyed by fire. By September of the same year, a modern fire-proof plant was built on the same site to take its place.

During this year, also, there was projected by the Owens Company what was considered the most advanced step in its bottle development—a machine for the manufacture of carboys, ranging in size from five to thirteen gallons. This machine of necessity was a much larger type, and in handling of ware many novel features were introduced.

Passing over the years of development, this machine was finally completed, tested out satisfactorily, licensed to the Illinois Glass Company and installed in their specially constructed plant at Alton, Ill.

Probably no machine built by the Owens Company so graphically illustrates the marvelous advances made in Owens Machine construction from the days of the early types. This carboy machine weighs 240,000 pounds, and requires 100 H.P. for its operation. Its glass furnace is fifty feet by twenty-five and one-half feet with a daily fuel requirement of forty tons of coal. The machine automatically manufactures five to six five-gallon bottles per minute, each weighing twelve pounds,—a total



The Carboy Machine

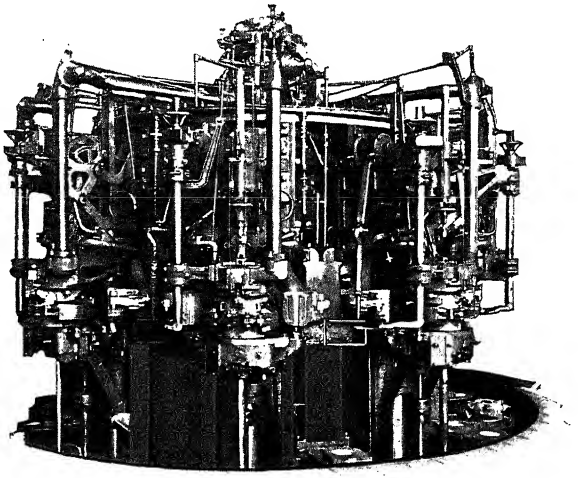
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Gallon Packer Machine

One of the most interesting of the entire group of Owens Machines now used. Like the Carboy Machine, its working mechanism extends through two floors.

of sixty to seventy-two pounds of glass per minute. In spite of the difference in size and nature of its product, the carboy machine operates in much the same manner as a machine making half-ounce bottles.

Changes were also made in the construction of the ten-arm machines. Up to this date all machines were operated by counter-weights in the gathering of glass—and by this it is understood the entire machine was lifted at the time the arm carrying the gathering mold came in contact with the glass in the revolving pot.

The improvements provided that each arm on the machine operated independently. In other words, the arm itself was raised and lowered instead of the entire machine. This eliminated the necessity for counter-weights, made a much smoother operating mechanism, and increased the production and efficiency.

The report of President Libbey for 1912, stated that 133 machines had been installed in the company's own plants and those of licensees; the total capacity of 7,000,000 gross of bottles—and that the new type of ten-arm machine was producing upwards of forty bottles a minute, or 400 gross a day.

This condition was little changed during 1913. One new licensee—the Maryland Glass Corporation of Baltimore, under the management of Philip I. Heuisler,

its President, was added to the Owens group. This plant was to specialize in the manufacture of blue glass —principally Bromo Seltzer bottles. It was considered advisable to concentrate as far as possible, all the production of blue glass for which there was a limited demand, under the control of one factory.

Only in one other respect was the year particularly notable, though each month brought a constantly increasing demand for the products of the Owens Company.

It was in 1913 that an unsolicited letter from a Special Agent of the National Child Labor Committee, of New York City, was received by the Owens Company. This letter voiced the opinion that the rapid introduction of the Owens machine into the glass industry had done more to eliminate child labor in many glass factories, than had the Committee's own legislative work, and that on a recent visit to an Owens machine-equipped factory, he was much pleased with the changed conditions as compared with those of ten years previously.

On the conditions in the early glass industry, John Spargo wrote in *Current Literature*, in 1906:

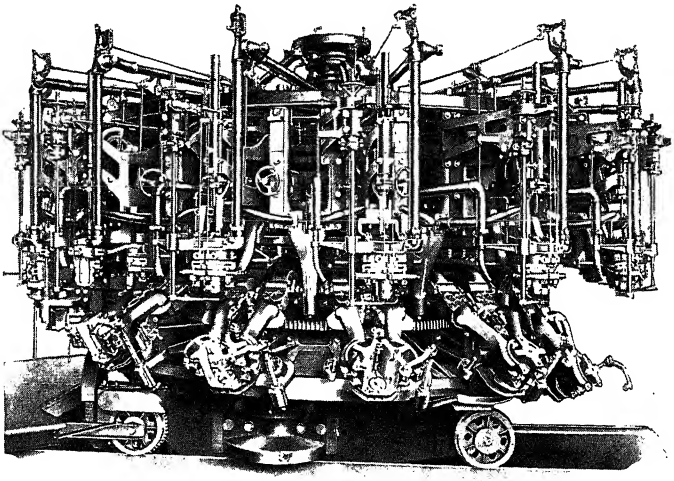
"I shall never forget my first visit to a glass factory at night. It was a big wooden structure so loosely

built that it afforded little protection from draughts, surrounded by a high fence, with several rows of barbed wire stretched across the top. I went with the foreman of the factory and he explained the reasons for the stockade-like fence. 'It keeps the young imps inside once we've got them in for the night shift,' he said. The young imps were boys employed, about forty in number, at least ten of whom were less than twelve years of age. It was a cheap bottle factory— cheapness and child labor go together. The hours of labor for the night shift were from 5:30 p.m. to 3:30 a.m.

"I stayed and watched the boys at their work and when their tasks were done, saw them disappear into the darkness and storm of the night. That night for the first time I realized the tragic significance of cheap bottles."

Without going into further details of the boys' work which Mr. Spargo included in his article, he continues: "The effect of the employment of young boys in glass factories, especially at night, is injurious from every point of view. The constant facing of the glare of the furnaces, and the red hot bottle causes injury to the sight.

"Minor accidents from burning are numerous. From working in draughty sheds, where they are often,



The Fifteen-Arm Machine

This type is in general use in the present day, weighing approximately 100,000 pounds, with an increase of 202% in capacity over the first commercial machine.

or as one boy stated, 'burning on the side next the furnace and freezing on the other,' they are frequently subject to rheumatism and fall ready victims to pneumonia.

"Of the fearful consequences," says Mr. Spargo, "there can be no question."

Happily, these conditions have changed, and to visit an Owens machine-equipped factory at night will conclusively demonstrate the truth that child labor in a modern bottle factory is of the past, never to return.

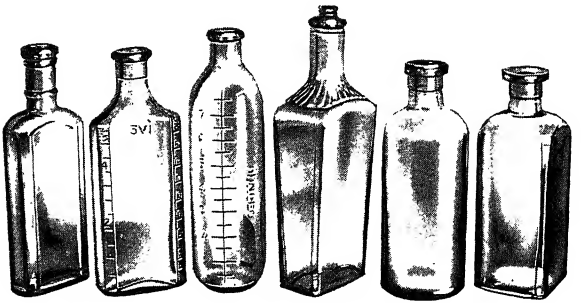
During 1914, President Libbey's annual report for that year states that the number of Owens Machines had then increased to 172 from a beginning of one in 1904. Machine production had advanced in these ten years to:

½-oz. Bottles, Round Prescriptions to 60 per minute.
2-oz. Bottles, Round Prescriptions to 52 per minute.
4-oz. Bottles, Round Prescriptions to 40 per minute.
8-oz. Bottles, Round Prescriptions to 36 per minute.
16-oz. Bottles, Round Prescriptions to 28 per minute.

It was also during this year that the Illinois Glass Company equipped its plant at Gas City, Ind., in addition to its Alton, Illinois, plant.

At the same time, The Charles Boldt Company con-

American Bottles · Old and New



Present-Day Prescription and Proprietary Bottles



Present-Day Bottles for Condiments and Fruit Juices

Of the thousands of shapes and sizes of bottles now made by The Owens Bottle Company, space permits but a few of the most representative styles to be shown.

structed and equipped a most modern fire-proof factory at Huntington, W. Va., the equipment consisting of three furnaces, six ten-arm machines and six automatic leers.

In his report, Mr. Libbey also refers to the construction of the latest model of machine with fifteen operating units or arms. This new machine weighed approximately 100,000 pounds, with an increase of 202% in capacity over the first commercial machine.

The year 1914 was closed by the purchase from its stockholders, the Owens Eastern Bottle Company's factory at Clarksburg, W. Va., and this plant was merged into the group of Owens Company's factories.

During the summer of 1914, a depression in the glass industry became notable. With the development of the World War this condition was greatly accentuated.

As a result, in 1915, the Owens Company directed its attention almost entirely to the manufacture of bottles in its various factories.

Progress was made, however, in development of machines, especially those of the fifteen-arm type which were installed in factories of two licensees. More than a 300% increase was the result over the first commercial machine. In addition, fourteen ten-arm machines were installed by licensees.



THE ELLIOTT CRESSON MEDAL

This medal was awarded Mr. Owens by The Franklin Institute of the State of Pennsylvania, for his invention of the Owens Bottle Machine.

Further Developments in United States

The year was notable for one event of great importance, and of special interest to Mr. Owens and the Owens Company.

On May 5, 1915, there was awarded Mr. Owens by The Franklin Institute of the State of Pennsylvania, for Promotion of the Mechanic Art—The Elliott Cresson Gold Medal.

Excerpts from the report of the Committee making the investigation of recognition, with a detailed report of the invention, are as follows:

"The inventor appears to be solely responsible for the development of the entirely Automatic Bottle-Making Machine. All other machines on the market are semi-automatic machines. The inventor has devoted many years of effort to the development of the Bottle-making machine, which effects a great saving in labor, and moreover, does not require any skilled labor to operate it, thereby lessening the costs of its product.

"In consideration of its novelty and utility, the Institute awards the Elliott Cresson Medal to Michael J. Owens, of Toledo, Ohio, for his Automatic Bottle Machine."

The recognition of Mr. Owens by so prominent an Institution was a source of much satisfaction to both

Mr. Owens and the Company which he represented.

In the following year, 1916, the outstanding feature was the purchase of the entire interests of The American Bottle Company by the Owens Company. This included the factories of the former, at a price of $8,500,000. The management of The American Bottle Company remained in the hands of its former efficient officers, Messrs. M. W. Jack, L. S. Stoehr and W. J. Crane.

The American Bottle Company, a consolidation of the former plants of the Ohio Bottle Company and Streator Bottle & Glass Company, was one of the first licensees of the Owens Company, and the largest manufacturer of bottles for beer, carbonated beverages, soda and water bottles.

The annual capacity of The American Bottle Company at this time was 2,000,000 gross or approximately 300,000,000 bottles. Its plants are at Newark, Ohio, and Streator, Illinois, and both are equipped with the latest types of machines and accessories. This Company is recognized in the trade as the most progressive manufacturer in its line.

About the same time, the Owens Company purchased the plants of the Graham Glass Company, at Evansville, Ind., and Loogootee, Ind., as well as an interest in the Graham Glass Company's plant at

Okmulgee, Okla. These plants remained in charge of their former managers, Messrs. Joseph, Robert and Ray Graham of Evansville, Ind.

It was further arranged in 1916 to add to the Whitney Glass Works' operation by constructing a modern six-machine plant, and work upon the buildings was started immediately.

The sales of the entire Owens owned plants for the year of 1916 amounted to 613,959,696 bottles, an increase of over sixty-six per cent from that of the previous year. There was also an extraordinary demand for Owens machines during the year—eighteen being installed in plants of the company and the licensees. At the close of the year, there remained forty-five machines on order. This demand was without precedent in the history of the company.

This addition of plants in 1916, together with the acquisition of the Owens Eastern Bottle Company—manufacturers of Prescription, Proprietary and Druggists' bottles—placed The Owens Bottle-Machine Company in the foremost rank as a manufacturer of a general line of bottles.

To acquire the plants of these companies and finance its constantly increasing business, the capital of The Owens Bottle-Machine Company was increased

to $16,307,400, which was again increased in 1917 to $17,342,275, in order to acquire the natural gas rights on about 6688 acres of land in Kanawha County, W. Va., as a fuel supply for its proposed Charleston, W. Va., factory.

The constantly increasing demand for bottles of all kinds taxed the capacities of all the Owens plants during the early part of 1917. So much so that steps were taken to provide for this increase by the building of a plant at Charleston, W. Va., as well as acquiring the former plant of the Greenfield Fruit Jar & Bottle Company, at Greenfield, Ind., the latter being out of operation at the time of purchase.

In the face of national prohibition, it was naturally anticipated that there would be a tremendous decrease in the use of bottles. The general public had come to think of a bottle principally as a container for beverages.

As a matter of fact, the bottles used for containers for all kinds of food products, water, medicinal compounds, toilet preparations and many other purposes too numerous to mention, being largely in excess of bottles used for beverages, continued to grow and with the substitution of soft drinks for liquors and beers, resulted in the greatest production of any year in the company's history.

as during 1917 that the company adopted the
f interesting its employees in the stock-holdings
ompany. Common stock with the par value of
00 was set aside for this purpose, $500,000 of
ount being allotted, and taken by, the employees
time.

une, 1917, Mr. E. D. Libbey resigned his posi-
President and was succeeded by Mr. Clarence
with Mr. Libbey as Chairman of the Board
ctors.

s change was brought about at Mr. Libbey's re-
order to relieve himself of the constantly grow-
ands in conducting the company's business, and
ire to give more time to personal affairs.

-ing this year the new plants at Charleston, W. Va.,
assboro, N. J., were practically completed.

addition to Owens machine development, the
ny, through its engineering department, took over
velopment work of the Graham automatic ma-
which was acquired with the purchase of the
n interests. This experimental work was begun
he thought of constructing a simpler type of
atic machine applicable to installation in smaller
, where Owens machines could not be operated.
installation of five of these machines was made

during the year at the plant of the Coshocton Glass Company at Coshocton, Ohio, under a license for the manufacture of beer and soda water bottles. The results were highly satisfactory.

Throughout the year the company's business continued its steady increase. A definite idea of the volume attained is shown by the following comparison:

1904—Prospectus figures—ninety gross per twenty-four hours.

1917—Average run per fifteen-arm machine—three hundred fifty gross per twenty-four hours.

1917—High run per fifteen-arm machine—four hundred thirty gross per twenty-four hours.

The total production, including those of the company's licensees, was 1,558,996,416 bottles.

On July 30, 1918, the sudden death of President Clarence Brown closed a brief, but extraordinarily important, incumbency. Mr. Brown's death, which came without warning, was the first break in the group of men connected with the Owens Company's development.

His passing was a severe loss, both to the company and to his friends, for Mr. Brown's life was filled with the strongest endeavors to assist those connected with him by ties of family, friendship and business. No more fitting tribute can be presented than that of the Direc-

tors of the Company, which was mailed to each of the company's stockholders:

"Clarence Brown, President of The Owens Bottle-Machine Company, died July 30, 1918, at his home in Toledo, Ohio.

"Mr. Brown was, from their inception, actively connected with all of the enterprises which grew out of the inventions of Michael J. Owens, and his associates. He had been a stockholder, director and officer of The Owens Bottle-Machine Company since its organization, and for many years prior to assuming the duties of President in July, 1917, had acted in the capacity of Vice-President and General Counsel.

"He was similarly interested in The Toledo Glass Company, the parent company, organized in 1895, The Owens European Bottle-Machine Company and The Libbey-Owens Sheet Glass Company. From the organization of all of these companies, through the important periods of construction and development, he devoted himself assiduously to their affairs, giving to each the benefit of his rich experience of the law and of his sound judgment in business affairs.

"To his associates in the Owens' Companies, his loss is irreparable. Endowed intellectually as few men are, possessed of a delightful personality and full of an

infectious optimism, his presence was an inspiration—a guidon of cheer and hope. He was charitable and proved it by his deeds. He was just, tolerant of others' opinions, and tactful in advancing his own. He was a gentleman without limitations, a scholar without pedantry. His rare qualities of heart and mind won for him a host of friends. Smiling, confident and courageous, he fulfilled his mission and, like the true knight, passed through the mysterious portals unquestioningly —'A man who so lived his life that he passed into the unknown with faith sublime.' "

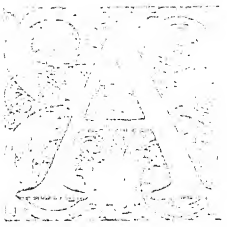
Personally, the author wishes to add his individual tribute, following almost twenty years of close contact with Clarence Brown.

His friendship was beyond question. His sympathy and assistance were always ready for a friend in trouble, and his counsel was invariably of the best in personal and business affairs. His loss has been irreparable, and in the succeeding days his absence from our Board has ever been felt.

Mr. Brown, in his death, exampled what had been his practice in life—bequeathing the greater part of his estate to the various charities of his city without question of creed, color or race. He died, as he lived, beloved by all his associates.

Chapter VI

PREPARING FOR FURTHER PROGRESS



T THE request of the Directors of the Company, Mr. Libbey, much against his inclination, resumed the position of President, and at the time of this writing remains in that office.

The remainder of the year, 1918, and following through 1919, has not been marked with changes of great consequence, except in the continued advancement of the general business. One especial incident, however, is that of acquiring a controlling interest in the business of The Charles Boldt Glass Company, and the addition of its President, Mr. Charles Boldt, to the Board of Directors of the Owens Company.

This enlargement of the company's interests in manufacturing plants, and Mr. Boldt's addition to its management, thoroughly established the company in the foremost rank of the world's bottle manufacturers.

It was considered advisable to change the corporate name from The Owens Bottle-Machine Company to The Owens Bottle Company, for the company had become firmly established as a manufacturer of bottles, in addition to being a licensor of bottle-blowing machines.

The principal business in the future would be that of manufacturing bottles. This change was effective May 1, 1919.

At the close of 1919, those directors closely connected with the company's history deemed it advisable to relinquish the general management into younger hands, realizing that the future of the company's business would demand closer attention than could be given by them, and at the same time allow these older men relief from the cares of business, retaining, however, a general supervision of affairs.

With this object in view, Mr. James C. Blair was elected Vice-President and General Manager; Mr. John D. Biggers, Vice-President and Assistant General Manager; Mr. William H. Boshart, Vice-President and General Sales Manager; and Mr. Herbert H. Baker, Treasurer. All of these men, after years of preparation, are equipped to further carry on the company's advancement and development.

In conclusion—throughout the history of the company, its success has been brought about by close relationship between its officers and employees for the benefit of all. The business has grown from nothing to that of the largest manufacturer of its line in the world. The Company's developments in manufacturing bottles

have changed completely the methods of many centuries. With such progress made in one decade in the glass industry, what prophecy may foretell the changes and advancements of the succeeding decade?

